U. S. Weather Bureau.
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INSTRUCTIONS FOR EXPOSURE AND INSTALLATION OF AIRWAYS INSTRUMENTS.

Wind instruments:- Wind instruments will be exposed where a free movement of the wind occurs, obstructed as little as possible by nearby structures or objects. This is obtained by elevating the vane or anemometer by means of vertical pipe supports, usually mounted on buildings or towers. The instruments must be readily accessible for cleaning, oiling, and occasional adjustments.

Two types of supports are standard for airways weather stations. (a) A 7-foot support of 1-inch pipe for anemometer or contracting windvane used on airways beacon-light towers; and (b) a 12-foot support of 1-1/4 inch pipe for wind vane and anemometer for roof installations.

Tower supports: The tower support for anemometer or wind vane consists of a railing base into which a piece of 1-inch pipe is screwed, the base fastened to a corner of the square wooden platform of the tower. A 1-inch x 1/2-inch coupling surmounts the upper end of the pipe into which coupling a brass anemometer pin or the wind-vane bearing is screwed, the former fitting the recess in the base of the anemometer casing.

When an anemometer support only is required, it should be placed over a tower corner nearest the point from which the prevailing winds come. When both anemometer and contacting wind vane are needed, the pipe supports should be located at diagonally opposite corners of the platform if possible, the line of centers of the support approximately normal to the prevailing wind direction.

Each 1-inch pipe will be held securely in place by attachment to the platform handrailing by an angle iron 18" long, which in turn is held by hook bolts to the angle iron forming the railing. Two similar hook bolts and a strap iron are used to clamp the 1-inch pipe to the 18-inch angle.

12-foot wind-instrument support:- The 12-foot support is intended for erection on the roof of the building, the combined height of building and support to be sufficient to give the anemometer a reasonably free exposure.

The support will be so installed as to secure a good exposure of the wind instruments, and at the same time provide ample safety for the man who will have to climb it in all kinds of weather. This safety is accomplished almost entirely by the secure attachment of the guy-rod footings to the roof. Three 8-inch eye bolts, each with

nut and washer, also three foot plates, are provided with each support, one bolt or plate for each footing, the bolts to be used where access can be had to the under side of the roof. Otherwise the shoes are required, fastened to the roof with lag screws, one shoe for each of the three guy rods.

The base plate and shoes should be placed if practicable over the roof rafters. If this can not be done or the roof is of unusually light construction, two-inch wooden blocks or short planks should first be screwed to the roof, the shoes being attached to the blocks. Roof cement placed under the timbers or other members attached to the roof will prevent leakage. Give the support a coat of paint after erection.

Installing contacting windvane bearing:- The device consists of the following parts: One windvane bearing made of half-inch pipe, with keyway bushing to form the top bearing and a pivot support to form the lower bearing; one windvane axis with a special cam-equipped weather housing rigidly attached; one set of insulated contact springs spaced 90 degrees apart on a collar that fits over the half-inch pipe; one wind vane; one windvane clamping nut.

To set up the device for use, first erect the half-inch pipe bearing firm and vertical in the desired location. Then fill the bearing about half full of light automobile oil. Next slip the contact spring assembly over the pipe and temporarily clamp it, springs upward and lower edge of brass collar between the two rings that will be found on the pipe 2-13/16 and 3-inches respectively below the top. (These rings mark safe working limits and provide for longer life by occasional change of position). Now insert the axis, being careful to rotate it slowly so as to feel the key in the axis through the keyway in the top bearing. This key arrangement permits withdrawal in one and only one position. Next put on the vane with due regard to provisions made for insuring its position relative to its axis, generally a pin extending into a hole in the brass housing of the axis.

Orientation requires that the vane be tied or otherwise temporarily secured in a true north direction. The contact spring assembly is then rotated until one of the springs, no matter which one, comes evenly spaced opposite a notch in the housing which indicates the mid-position of the contact cam. This contact spring now becomes the north one, and should have the north wire attached. The other three wires are then clamped to the corresponding binding posts, which are sufficiently identified by their positions. The common or battery wire is to be well grounded to the upright metal support. As in all electrical installations it pays to take time to connect terminals carefully with well formed loops under

the binding nuts. The resulting indications should of course be verified by two observers, one holding the vane in its positions, the other observing the indications in the office. There is also a sleet shield which should be temporarily removed, then replaced after all connections have been made.

Wiring:- The anemometers are all of the electrical indicating type, the wind vanes either indicating or non-indicating. Two types of anemometer indicators are used; one utilizing a buzzer and push-button switch wired in series with a two-cell dry battery placed within the box forming a part of the indicator; the other having a buzzer and bell-ringing transformer instead of a battery mounted on a small board without a switch. When the direction is also indicated four lamps are mounted on the board in the form of a square with the north lamp at the upper corner.

When using either type of anemometer indicator, wire from the two indicator binding posts to the anemometer, employing No. 14 or 16 wire cable, or weather-proof twisted telephone pair. Two-conductor lead-covered cable is often desirable, for more or less permanent installations, especially on the towers. Between building and tower the cable may sometimes be buried underground to advantage. The outer terminals of the cable will be firmly secured to the left-hand binding posts of the anemometer, (observer facing the dials); one terminal to the large post near the base of the casing, the other to the nickelled post at the back of the dial case.

The combined direction and velocity indicator requires one wire to each of the direction contacts in addition to the anemometer connections, the transformer or battery lead to the support being common to both anemometer and direction contacts. Seven-conductor lead-covered cable is issued for the wiring of this indicator.

The transformer-operated indicator requires connection in addition to the 110-volt alternating-current lighting circuit. This connection is neatly made with No. 14 lamp cord, although other forms of conductor will do. The connection will be as short as practicable, and the light socket or other outlet or switch so placed as to be convenient to switch the current on or off. A location on or over a desk is desirable. To operate, it is only necessary to turn on the lighting current, and the buzzer is then free to respond to the circuit closures through the anemometer, as many times per minute as the wind is blowing miles per hour, and one or two of the direction lamps are lighted when used, giving directions of the wind to eight points.

Battery-operated anemometer indicators are similarly employed, excepting that a push-button switch is used to close the circuit instead of the electric light switch or plug.

Should the lighting current fail when an observation is required, two dry cells should be substituted temporarily for the transformer secondary of the velocity indicator, or 4 cells for the direction and velocity indicator.

Thermometer and shelter:- A thermometer should have free exposure to the outdoor air, and at the same time be shielded from the direct or reflected rays of the sun, and be free from the effects of artificial heat. This is accomplished by placing the thermometer in a specially constructed shelter which will be erected as shown in the illustration with the shelter bottom about 4 ft. 4 in. above the ground, preferably sod covered, with the door facing the north. The mercury thermometers such as are furnished to airways stations will be exposed vertically with the bulb end down by attachment to the brass support furnished with each shelter, which latter is fastened to an upright wooden post near the center of the shelter.

A small magnifying glass is useful in reading the thermometer, and a flashlight is required for night observations. Keep the shelter locked except when observing.

Shelter installation:- The shelter will be mounted on a 4" x 4" post 8 ft. long, fastening the post to the shelter by means of two 5/16-inch carriage bolts. The post should be cedar or cypress when possible, or protected against decay in the ground by creosoting the lower three feet. Creosoted fence posts may also be used to advantage at times. After installation the post will be given two coats of white lead paint, and if the shelter needs it, a single coat.

Aneroid barometer:- Suspend the barometer indoors from a cup hook screwed into the wall or woodwork, where it will not be subject to extremes of heat or cold, or rapid changes in temperature, and where it will not be unduly jarred. The back of the instrument should rest flat against the vertical surface.

Drawings accompanying instructions:

1. Assembly of 12-foot support.
2. Clamp for tower anemometer of wind-vane support.
3. Airways shelter mounting.
4. Diagram of circuits, combined wind-direction and velocity indicator.